

Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 3-13, 16, 17 and 38-68 are pending in the application, with 38 and 60 being the independent claims. Based on the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Declaration

In paragraph 4 of the Office Action, the Examiner states that the declaration is defective. Applicants submit a supplemental declaration in compliance with 37 C.F.R. § 1.67(a) that identifies the application by application number and filing date. Thus, Applicants respectfully request that the objection to the declaration be reconsidered and withdrawn.

Rejections under 35 U.S.C. § 112

Claims 49 and 60-68 are rejected under 35 U.S.C. § 112, second paragraph. In paragraph 5, the Office Action states that "it is not clear what is meant by the following a) 'is flush with' (see claim 49); and b) 'window opening that is open at said first surface and said second surface of said substrate' (see claim 60). Applicants traverse the rejection.

The claim portion referred to by the Examiner in claim 49, which recites "is flush with" is disclosed in the specification at page 12, paragraph 0059. As stated in paragraph 0059, "[r]ing 502 is preferably flush with the outer edges of substrate 104 to form an outer edge of the BGA package, but may also reside entirely within or partially outside an outer profile of substrate 104." FIG. 5 shows an example embodiment where ring 502 is flush with the outer edges of substrate 104. Hence, Applicants assert that in light of at least these portions of the specification and drawings, claim 49 is sufficiently clear under 35 U.S.C. § 112.

The claim portion referred to by the Examiner in claim 60, which recites "window opening that is open at said first surface and said second surface of said substrate" is disclosed in the specification at page 11, paragraph 0055. As stated in paragraph 0055, "[s]ubstrate 104 in FIG. 5 has a central window-shaped opening 512." As shown in FIG. 5, opening 512 is open at the top and bottom surfaces of substrate 104. Hence, Applicants assert that in light of at least these portions of the specification and drawings, claim 60 is sufficiently clear under 35 U.S.C. § 112.

Accordingly, Applicants respectfully request that the rejection to claims 49 and 60 be withdrawn.

Rejections under 35 U.S.C. § 103

Claims 4-6, 8, 38, 42-46, 48-50, 60, 64, 65, and 67

Claims 4-6, 8, 38, 42-46, 48-50, 60, 64, 65, and 67 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,163,458 to Li (hereinafter Li)

in view of U.S. Patent No. 6,084,777 to Plepys *et al.* (hereinafter Plepys). Applicants respectfully traverse the rejection, and request that it be withdrawn.

Technical differences exist between Li and the present invention. Li appears to describe a ball grid array package. Referring to FIG. 2 of Li, the package includes a chip 30 mounted in a concavity 12 on the bottom surface of a substrate 10. Solder balls 16 are also attached to the bottom surface of substrate 10. A metal heat spreader 50 having a protuberance 52 covers chip 30. Bonding areas adjoin concavity 12 on the bottom surface of substrate 10, and are connected to bonding pads 32 of chip 30 through metal leads 40. (See Li, col 2, lines 1-15).

The present invention is directed to integrated circuit packages, such as a ball grid array package. As recited in independent claims 38 and 60, a substrate has a plurality of contact pads on a first surface electrically connected through the substrate to a plurality of solder ball pads on a second surface of the substrate. This is very different from Li. In Li, bonding areas 14 adjoin concavity 12 on the same surface of substrate 10 as solder balls 16 (see Li, col. 2, lines 6-8). Li does not disclose, teach, or suggest contact pads on the opposite side of the substrate from attached solder balls. In Li, it would not be possible for a contact pad on the opposite surface of substrate 10 from solder balls 16 to be directly accessed by bonding pads 32 of chip 30. Hence, Li does not disclose, teach, or even suggest a substrate having a plurality of contact pads on a first surface electrically connected through the substrate to a plurality of solder ball pads on a second surface, as recited in independent claims 38 and 60 of the present invention.

Furthermore, Plepys cannot be used to supply the missing teachings of Li. Plepys appears to describe a laminated integrated circuit package. As shown in FIG. 6 of

Plepys, a chip 32 is attached to a top surface of a substrate 60 in a flip-chip orientation. Conductive traces 62 are formed on the top surface of the substrate 60. Conductive traces 62 include an array of carrier bond pads 56 and BGA solder ball pads 64 formed on the top surface of tape 60 (see col. 6, lines 1-12). A stiffener 52 is attached to the top surface of substrate 60, and has a window 54 formed therein (see col. 7, lines 56-60).

Independent claims 38 and 60 of the present invention both recite a substrate having a plurality of contact pads on a first surface electrically connected through the substrate to a plurality of solder ball pads on a second surface of the substrate. As stated above, in Plepys, the array of carrier bond pads 56 and BGA solder ball pads 64 are formed on the top surface of tape 60. Thus, in Plepys, and in Li (as described above), bond pads and solder ball pads are located on the same side of the substrate, while as recited in claims 38 and 60 of the present invention, contact pads and solder ball pads are located on different sides (i.e., first and second surfaces) of the substrate, respectively. Hence, Plepys does not supply the missing teachings of Li.

Accordingly, Applicants respectfully submit that claims 38 and 60 are patentable over Li and Plepys, alone or in combination, for at least the reasons described above. Furthermore, Applicants respectfully submit that claims 4-6, 8, 42-46, 48-50, 64, 65, and 67, which depend from claims 38 and 60, are likewise patentable. As such, Applicants respectfully request that these rejections be withdrawn.

Claim 3

Claim 3 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Li in view of Plepys and U.S. Patent No. 6,084,777 to Kalidas *et al.* (hereinafter Kalidas). Applicants respectfully traverse the rejection, and request that it be withdrawn.

As described above, Li and Plepys, alone or in combination, do not teach or even suggest all of the subject matter of claim 38. Applicants further submit that Kalidas does not supply the missing teachings. Accordingly, Applicants respectfully submit that claim 3, which depends from claim 38, is patentable over Li, Plepys, and Kalidas taken alone or in combination. Applicants therefore request that the Examiner reconsider and withdraw the rejection of claim 3.

Claims 7, 11, 12, 47, and 51

Claims 7, 11, 12, 47, and 51 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Li in view of Plepys and U.S. Patent No. 6,002,169 to Chia *et al.* (hereinafter Chia). Applicants respectfully traverse the rejection, and request that it be withdrawn.

As described above, Li and Plepys do not teach or even suggest all of the subject matter of claim 38. Applicants further submit that Chia does not supply the missing teachings. Accordingly, Applicants respectfully submit that claims 7, 11, 12, 47, and 51, which depend from claim 38, are patentable over Li, Plepys, and Chia taken alone or in combination. Applicants therefore request that the Examiner reconsider and withdraw the rejection of claims 7, 11, 12, 47, and 51.

Claims 8, 9, and 66

Claims 8, 9, and 66 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Li in view of Plepys and U.S. Patent No. 3,790,866 to Meyer *et al.* (hereinafter Meyer). Applicants respectfully traverse the rejection, and request that it be withdrawn.

As described above, Li and Plepys do not teach or even suggest all of the subject matter of claims 38 and 60. Applicants further submit that Meyer does not supply the missing teachings. Accordingly, Applicants respectfully submit that claims 8, 9, and 66, which depend from claims 38 and 60, are patentable over Li, Plepys, and Meyer taken alone or in combination. Applicants therefore request that the Examiner reconsider and withdraw the rejection of claims 8, 9, and 66.

Claims 10 and 68

Claim 10 and 68 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Li in view of Plepys and U.S. Patent No. 5,901,041 to Davies *et al.* (hereinafter Davies). Applicants respectfully traverse the rejection, and request that it be withdrawn.

As described above, Li and Plepys do not teach or even suggest all of the subject matter of claims 38 and 60. Applicants further submit that Davies does not supply the missing teachings. Accordingly, Applicants respectfully submit that claims 10 and 68, which depend from claims 38 and 60, are patentable over Li, Plepys, and Davies taken alone or in combination. Applicants therefore request that the Examiner reconsider and withdraw the rejection of claims 10 and 68.

Claim 13

Claim 13 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Li in view of Plepys, Chia, and U.S. Patent No. 6,166,434 to Desai *et al.* (hereinafter Desai). Applicants respectfully traverse the rejection, and request that it be withdrawn.

As described above, Li and Plepys do not teach or even suggest all of the subject matter of claim 38. Applicants further submit that Chia and/or Desai do not supply the missing teachings. Accordingly, Applicants respectfully submit that claim 13, which depends from claim 38, is patentable over Li, Plepys, Chia, and Desai taken alone or in combination. Applicants therefore request that the Examiner reconsider and withdraw the rejection of claim 13.

Claims 16, 17, 52, 53, and 57-59

Claims 16, 17, 52, 53, and 57-59 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Li in view of Plepys, Chia, Desai, and Davies. Applicants respectfully traverse the rejection, and request that it be withdrawn.

As described above, Li and Plepys do not teach or even suggest all of the subject matter of claim 38. Applicants further submit that Chia, Desai and/or Davies do not supply the missing teachings. Accordingly, Applicants respectfully submit that claims 16, 17, 52, 53, and 57-59, which depend from claim 38, are patentable over Li, Plepys, Chia, Desai, and Davies, taken alone or in combination. Applicants therefore request that the Examiner reconsider and withdraw the rejection of claims 16, 17, 52, 53, and 57-59.

Claims 39-41 and 61-63

Claims 39-41 and 61-63 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Li in view of Kalidas and U.S. Patent No. 6,212,070 to Atwood *et al.* (hereinafter Atwood). Applicants respectfully traverse the rejection, and request that it be withdrawn.

As described above, Li does not teach or even suggest all of the subject matter of claims 38 and 60. Applicants further submit that Kalidas and/or Atwood do not supply the missing teachings. Accordingly, Applicants respectfully submit that claims 39-41 and 61-63, which depend from claims 38 and 60, are patentable over Li, Kalidas, and Atwood, taken alone or in combination. Applicants therefore request that the Examiner reconsider and withdraw the rejection of claims 39-41 and 61-63.

Claims 54-56

Claims 54-56 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Li in view of Plepys, Chia, Desai, Davies, and Atwood. Applicants respectfully traverse the rejection, and request that it be withdrawn.

As described above, Li and Plepys do not teach or even suggest all of the subject matter of claims 38 and 60. Applicants further submit that Chia, Desai, Davies, and/or Atwood do not supply the missing teachings. Accordingly, Applicants respectfully submit that claims 54-56, which depend from claim 38, are patentable over Li, Plepys, Chia, Desai, Davies, and Atwood, taken alone or in combination. Applicants therefore request that the Examiner reconsider and withdraw the rejection of claims 54-56.

Double Patenting

Claims 3-13, 16, 17, and 38-68 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-13 of U.S. Patent Application No. 09/997,272, over claims 1 and 11-13 of U.S. Application No. 09/984,259, and over claims 1-33 and 57 of U.S. Application No. 09/742,366. Applicants respectfully request that these rejections be held in abeyance until allowable subject matter is indicated.

Objection to Claim 59

Paragraph 21 of the Office Action states that should claim 58 be found allowable, claim 59 will be objected to under 37 C.F.R. § 1.75 as being a substantial duplicate thereof. Applicants have reviewed claims 58 and 59, and respectfully disagree with this prospective objection. Claims 58 and 59 include explicitly recited differences. Claim 58 recites that "said conductive material filling said via thermally couples said conductive bump to said heat spreader," while claim 59 recites that "said conductive material filling said via electrically couples said conductive bump to said heat spreader." Thus, Applicants respectfully disagree with the propriety of this prospective objection, and request further clarification thereof.

Conclusion

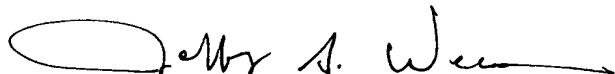
All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the

Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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Version with markings to show changes made

No amendments were made.